

TO WHOM IT MAY CONCERN:

Be it known that we, Ryan Giffin Moore, Richard A. DeSenna, Hilton G. Dawson, and Kenneth Scott Wiley, citizens of the United States of America, residing at 11500 Donnington Drive, Duluth, Georgia 30097, 110 Waterford Falls Drive, Canton, Georgia 30144, 5070 Arcado Road, Lilburn, Georgia 30047 and 4565 Briarwood, Oakwood, Georgia 30566 respectively, have invented new and useful improvements in a

**CARRIER FOR LIQUID INGREDIENTS TO BE USED IN EFFERVESCENT
PRODUCTS**

of which the following is a specification.

CERTIFICATE OF EXPRESS MAIL

I hereby certify that this correspondence is being deposited with the United States Postal Service as "Express Mail Post Office To Addressee" in an envelope addressed to: Commissioner of Patents and Trademarks, Washington, D.C., 20231, on March 21, 2001.

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Jo Bryan

TITLE OF THE INVENTION
CARRIER FOR LIQUID INGREDIENTS TO BE USED IN EFFERVESCENT
PRODUCTS

CLAIM OF PRIORITY AND CROSS-REFERENCE TO RELATED
APPLICATIONS

This application is a continuation-in-part of co-pending U.S. patent application entitled, "Carrier for Liquid Ingredients to be Used in Effervescent Products," filed on March 9, 2001, and accorded serial number 09/802591 [Attorney Docket No. 081915-1280], and claims priority to co-pending U.S. provisional patent application entitled "Carrier for Liquid Ingredients to be Used in Effervescent Products" filed on November 3, 2000 and accorded serial number 60/245,614, which is entirely incorporated herein by reference. This application is related to co-pending U.S. provisional patent application entitled "Solvent for Liquid Ingredients to be Used in Effervescent Products" filed on November 3, 2000 and accorded serial number 60/245,850, which is entirely incorporated herein by reference.

TECHNICAL FIELD

The present invention is generally related to use of a carrier for liquid ingredients to be used in cleaning products, and, more particularly, is related to a method for producing effervescent products from liquid ingredients.

BACKGROUND OF THE INVENTION

One major limitation in effervescent cleaning, disinfecting, or other products was the amount and type of liquid and active ingredients that could be incorporated into effervescent formulations. Generally, less than 25% by weight of the tablet was available for active ingredients. Typically, surfactants, *e.g.*, anionic, nonionic, cationic and

amphoteric, could be used at no more than 5% of the formulas because these ingredients reduced the storage stability of carbonate-based effervescent products, made conventional granulation or tableting difficult or impossible and dramatically increased the dissolution time of the resulting products. Generally, solvents were incompatible with effervescent products. They were either very hydrophobic and were incompatible with aqueous systems or are sufficiently hydrophilic to initiate the effervescent reaction, thus making the product unstable. Many surfactants were available only as liquids containing water or alcohol and could not be employed at any useful level in effervescent formulas.

Previously, solvents were primarily used in effervescent tablet production for wet granulation and had to be evaporated off to produce the finished tablet.

As noted previously, in typical effervescent tablets, less than 25 % by weight of the tablet was usually available for ingredients other than the effervescent system. For example, although up to 75 % by weight of the tablet weight could be a binder, 10% to 25% was typically used. The effervescent system typically accounted for up to 50% of the tablets. It should be noted that the greater the percentage of the effervescent system that was used, the quicker the tablet dissolved. Lubricants, which help in tablet production, comprise up to 10% by weight of the tablet. Fragrance and color make up approximately 2% of the tablet. It was found that high levels of fragrance adversely affected tablet stability, dissolution, hardness and tablet production.

Thus, a heretofore unaddressed need exists in the industry to address the aforementioned deficiencies and inadequacies.

SUMMARY OF THE INVENTION

The present invention provides both an effervescent compound and a method for making an effervescent compound. Briefly described, the effervescent compound includes an effervescent system, liquid ingredients and optionally a solvent. The solvent of the effervescent compound is compatible with the effervescent system and may be both

hydrophilic and have low solubility with effervescent ingredients. In general terms, the solvent may include glycols, alcohols and glycol ethers. The effervescent system of the effervescent compound may include either expanded sodium perborate (ESPB) and/or a mixture of an acid and one or more of sodium bicarbonate, sodium carbonate, potassium carbonate and potassium bicarbonate. The compound may further include any one, all, or any combination of the following ingredients: a surfactant, bleaching composition, an anti-redeposition agent, a binder, a chelating or sequestering agent, a lubricant, a color, a fragrance, and/or an optical brightener.

The present invention can also be viewed as providing a method for making an effervescent compound. In this regard, the method can be broadly summarized by the following steps: providing a liquid ingredient; providing an effervescent system in powder form; and mixing the liquid ingredient with the effervescent system, thereby producing a free-flowing effervescent compound. Alternate embodiments of the present invention include the further steps of dissolving ingredient in a solvent and mixing the resulting solution with the effervescent system thereby producing a free-flowing effervescent compound. Further steps may include compressing the effervescent compound and forming granules of the effervescent compound. Further, in an alternative embodiment, the method may also include compressing the effervescent compound and forming a tablet from the effervescent compound.

Other systems, methods, features, and advantages of the present invention will be or become apparent to one with skill in the art upon examination of the following detailed description. It is intended that all such additional systems, methods, features, and advantages be included within this description, be within the scope of the present invention, and be protected by the accompanying claims.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The present invention is able to solve the aforementioned deficiencies and inadequacies by using an ESPB, produced by dehydration of a sodium perborate hydrate, in the production of effervescent compounds in the form of tablets, granules or powders. ESPB can adsorb significant levels of liquids and remain free flowing. Anhydrous sodium perborate effervesces, but has been reported to be difficult to use in tablets without the addition of additives. See U.S. Pat. No. 4,409,118 and 4,857,224, both to Eoga. ESPB prepared by dehydration of monohydrate is surprisingly very easy to tablet, and maintains its flow and tableting characteristics after adsorbing up to its own weight in liquid. Further, the amount of effervescence is potentially sufficient to eliminate the need for additional effervescent materials permitting effervescent tablets, granules or powders to be produced that contain up to 50% liquid ingredients.

By using ESPB as the carrier to hold all liquid ingredients for the tablets, liquid surfactants may be loaded at high levels into the effervescent products. Solvents, both volatile (*e.g.*, alcohols, ethers) and non-volatile, (*e.g.*, glycerine, propylene glycol) can be loaded at high levels and used in the effervescent products. Further, oils and fragrances may be loaded at high levels and used in the effervescent products as well. In the effervescent products of the present invention, solvents can be used to dissolve surfactants or other slow to dissolve materials, and loaded onto the carrier, *i.e.*, ESPB, for use in the effervescent tablets. It should be noted that this dissolution increases the solubility rate of hydrophobic ingredients. Up to a 1:1 loading of liquids can be used, and the resulting free-flowing powder may be used in effervescent tablets or granules.

The solvents used in the present invention can be used to dissolve many active ingredients, which results in an improved solubility rate for the effervescent compound. In various embodiments of the present invention, many different solvents may be used. In the preferred embodiment, the solvent is sufficiently hydrophilic to be used in aqueous products, but does not initiate an effervescent reaction with the effervescent ingredients of



the effervescent compound. Preferably, the solvent can also be used as an active ingredient in the effervescent compound. In one embodiment of the present invention, the solvent includes a glycol ether. In the preferred embodiment, the solvent comprises, for example, but is not limited to, 2-butoxyethanol. Solvents of this type used in the present invention do not adversely affect either the physical or chemical stability of the effervescent compound, and also provide the possibility of tabulating or granulating the effervescent compound.

The effervescent compound including the solvent described above may be formed into a tablet. "Tablet" means both tablets and the granular form of effervescent products. "Granular" means uniform-sized compressed mixtures. These tablets are shelf stable and have good physical properties. For example, but not limited to these physical characteristics, the tablets may be hard; non-friable; of minimum size, both in weight and dimension for the application; and have an increased dissolution rate over tablets not made with the solvent of the present invention.

The effervescent system of the present invention may be, for example, but is not limited to, ESPB, and/or a mixture of an acid and one or more of sodium bicarbonate, sodium carbonate, potassium carbonate and potassium bicarbonate. Typically, the effervescent system is in a powdered form. If ESPB is used as the effervescent system, the liquid ingredients may be present in the effervescent compound of the present invention in an amount up to approximately 50% by weight of the composition. If, however, a carbonate/acid system is used, the liquid ingredients may be used up to an amount of approximately 35% by weight of the effervescent compound. If the solvent is used alone with the effervescent system, and no other ingredients are added, the solvent itself may act as a cleaning ingredient, including, for example, but not limited to, a "degreaser", which is a compound that will render oils miscible with water.

Many other ingredients, preferably in powder form, may also be added to the solvent and included in the effervescent compound. Desirable, but not necessary,

characteristics of these ingredients include being compressible, free-flowing, concentrated, and not being sticky. These ingredients include, but are not limited to, the following: surfactants, bleaching compositions, optical brighteners, anti-redeposition agents, chelating or sequestering agents, binders, lubricants, colors, and/or fragrances. These ingredients may be used in any combination, depending on the application sought for the effervescent compound of the present invention. Examples of surfactants that may be added to the effervescent compound include, but are not limited to: synthetic anionic surfactants which are generally water-soluble; alkali metal salts of organic sulfates and sulfonates; non-ionic surfactants which are generally the reaction products of alkylene oxide with alkyl phenol or primary or secondary alcohols; amine oxides; phosphine oxides; dialkyl sulphoxides; amphoteric or zwitterionic surfactants; and/or soaps. Examples of the bleaching composition that may be used include, but are not limited to, chlorinated isocyanurates, perborate hydrates, persulfates or percarbonates. Examples of the anti-redeposition agent include, but are not limited to, acrylates and cellulose derivatives. The binder used in the effervescent compound may include, for example, but is not limited to, starch and starch derivatives, cellulose and cellulose derivatives, carbohydrate gums, sugars, resins, proteins and inorganic salts. Examples of the lubricant include, but are not limited to, sodium benzoate, sodium stearate, magnesium stearate, aluminum stearate, stearic acid, mineral oil and polyethylene glycol.

There are several examples of effervescent products that may be made with the carrier of the present invention, for example, including, but not limited to, a carpet cleaner, a glass cleaner, a laundry detergent, an all-purpose cleaner, and a hard surface cleaner/disinfectant. The various cleaning products that may be made from the solvent of the present invention may be in tablet, granular, or powder form. When in tablet form, the various cleaning products may be dissolved in a liquid solution to form a cleaning solution. The liquid solution in the preferred embodiment is water, but may also be any liquid suitable for dissolving and using the cleaner of the present invention, including for



example, but not limited to, an alcohol, *e.g.*, low molecular weight alcohols such as methanol, propanol and isopropanol; an aldehyde, *e.g.*, formaldehyde or acetaldehyde; or a ketone, *e.g.*, a low molecular weight ketone such as acetone, methyl ethyl ketone, methyl isopropyl ketone, or methyl propyl ketone. Table 1 below gives exemplary products in the form of detergent or cleaner tablets that may be made with the solvent and the present invention, and the volume of liquid in which the respective cleaner may be dissolved to form a cleaning solution.

Table 1. Exemplary Products and Dilution Volumes

<u>Product</u>	<u>Approximate Product Weight (g)</u>	<u>Approximate Dilution Volume</u>
laundry detergent	30-120	12 gallon
carpet cleaner	25-100	1 gallon
all-purpose cleaner	10-40	1 liter
glass cleaner	7-30	1 liter

The above weight and volume ranges are merely possible embodiments of the cleaners or detergents of the present invention, and other possible weight ranges would be known to those skilled in the art based on the disclosure herein. For example, in each example, dosages less than specified could be used with reduced performance and higher doses could also be used, but may result in wasting of the cleaning product. The preferred embodiment of each example given above follows: for the laundry detergent, approximately two 30-gram tablets or one sixty-gram tablet is used in a typical wash load of approximately 12 gallons; for the carpet cleaner, approximately 50 grams of cleaner is dissolved in approximately one gallon of liquid solution; for the all-purpose cleaner, approximately 19 grams of cleaner is dissolved in one liter of liquid solution; for the glass

cleaner, approximately 15 grams of cleaner is dissolved in approximately one liter of liquid solution.

The effervescent carpet cleaner that may be made from the carrier of the present invention can include liquid ingredients in an amount up to 50% by weight of the carpet cleaner. For example, but not limited to, approximately 23% by weight of the composition may be a solvent, which had not previously been accomplished in previous carpet cleaners. Further, the exemplary embodiment of the carpet cleaner using the carrier of the present invention may include surfactant in an amount, for example, but not limited to, approximately 20% by weight of the composition, which is four times the usual concentration of surfactant that has been used heretofore in effervescent cleaners. Additionally, this exemplary embodiment of the carpet cleaner may include a fragrance in an amount, for example, but not limited to, approximately 3% by weight of the composition. Thus, this exemplary carpet cleaner may include liquid ingredients, for example, but not limited to, approximately 46% by weight of the effervescent cleaner, which is five to ten times the amount that was previously possible for the liquid concentration. Further, the carpet cleaner tablet made using the carrier of the present invention has a dissolution time of less than five minutes at 40 °C.

Another example of a cleaner that may be produced using the carrier of the present invention is a glass cleaner. The glass cleaner may be made in, for example, but not limited to, granular or tablet form. The glass cleaner may incorporate liquid ingredients in an amount up to 50% by weight of the glass cleaner. In an exemplary embodiment, the glass cleaner may include, for example, but is not limited to, approximately 30% solvent by weight of the composition, which had not previously been accomplished in conventional effervescent products. Further, this exemplary glass cleaner may include, for example, but is not limited to, approximately 5% by weight surfactant, and therefore rendering the liquid ingredients, for example, but not limited to,

approximately 35% by weight of the composition. Further, the glass cleaner also has a dissolution time of less than approximately five minutes at approximately 40 °C.

Another example of a possible cleaner that may be produced using the carrier of the present invention is a laundry detergent. This laundry detergent may include liquid ingredients in an amount up to 50% by weight of the laundry detergent. In an exemplary embodiment of the laundry detergent, the liquid surfactant may be present in an amount, for example, but not limited to, approximately 24% by weight of the composition, an amount that had not previously been accomplished in effervescent cleaners. This exemplary laundry detergent may also include, for example, but not limited to, approximately 5% fragrance, which is two to five times the amount that has been used in typical effervescent formulas. The laundry detergent has a dissolution time of less than five minutes at 20 °C.

Another example of a possible cleaner that may be produced using the carrier of the present invention is a hard surface cleaner/disinfectant. This hard surface cleaner may include liquid ingredients in an amount up to 50% by weight of the hard surface cleaner/disinfectant. In an exemplary embodiment of the hard surface cleaner, the solvent may be present in an amount, for example, but not limited to, approximately 24% by weight of the composition, an amount that had not previously been accomplished in conventional hard surface cleaners. This exemplary hard surface cleaner may also include, for example, but not limited to, approximately 15% quaternary ammonium salts (quat), which is five times the amount that has been used in conventional effervescent tablets. This exemplary hard surface cleaner may additionally include surfactants in an amount, for example, but not limited to, approximately 5% by weight of the composition. The hard surface cleaner also has a dissolution time of less than approximately five minutes at approximately 40 °C.

Also included within the scope of the present invention is a method for making an effervescent compound that includes the steps of providing a solvent and/or liquid

ingredient, providing an effervescent system in powder form, and mixing the solvent with the effervescent system, thereby producing a free-flowing effervescent compound. The method may also include the steps of compressing the compound and forming either granules or a tablet of the effervescent compound. The solvent used in the step of providing a solvent is preferably both hydrophilic and has low solubility with effervescent ingredients. The solvent may be, for example, but is not limited to, glycols, alcohols and glycol ethers, *e.g.*, 2-butoxyethanol.

The effervescent system used in the step of providing an effervescent system in powder form may be, for example, but is not limited to ESPB and/or a mixture of an acid and one or more of sodium bicarbonate, sodium carbonate, potassium carbonate and potassium bicarbonate. The method may further include the steps of providing other ingredients in a powder form that are to be mixed with the solvent and the effervescent system, thereby producing the effervescent compound. These ingredients include, but are not limited to, any one or any combination of the following: surfactants, bleaching compositions, optical brighteners, anti-redeposition agents, binders, lubricants, colors, and/or fragrances. If necessary, these ingredients may be mixed with or dissolved in the solvent, and, if necessary, distilled to remove any water or low boiling-point alcohol or any liquid with a boiling point lower than that of the solvent. The resulting liquid can then be used in the effervescent compound. It should be noted that the resulting effervescent compound including the solvent of the present invention is stable and has good tableting and dissolution characteristics.

It should be emphasized that the above-described embodiments of the present invention, particularly, any "preferred" embodiments, are merely possible examples of implementations, and are merely set forth for a clear understanding of the principles of the invention. Many variations and modifications may be made to the above-described embodiment(s) of the invention without departing substantially from the spirit and principles of the invention. All such modifications and variations are intended to be

included herein within the scope of this disclosure and the present invention and protected by the following claims.